WHAT IS CLAIMED IS:

1. A method for producing a semiconductor device, comprising the steps of:

non-epitaxially growing a first conductive film on a barrier film having a crystal structure;

forming a second conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film.

2. The method of claim 1, wherein each of the first conductive film and the second conductive film is formed of copper or a metal mainly containing copper.

3. The method of claim 1, wherein the resistivity of the third conductive film is equal to or smaller than 1.9 $\mu\Omega \cdot cm$.

4. The method of claim 1, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than 2.2 $\mu\Omega \cdot cm$.

5. The method of claim 1, wherein the step of growing the first conductive film is performed at a temperature which is equal to or lower than a 1/3 of the absolute temperature of the melting point of the first conductive film.

6. The method of claim 1, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature which is equal to or lower than a 1/2

of the absolute temperature of the melting point of the third conductive film.

7. The method of claim 1, wherein the barrier film is a tantalum film or tantalum alloy film.

8. The method of claim 7, wherein the crystal structure of the tantalum film or tantalum alloy film is a β-structure.

9. The method of claim 1, wherein the step of growing the first conductive film includes the step of forming the first conductive film by a physical vapor deposition method or a chemical vapor deposition method.

10. The method of claim 1, wherein the step of forming the second conductive film includes the step of forming the second conductive film by a chemical vapor deposition method or a plating method.

11. The method of claim 1, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature equal to or lower than 200°C.

12. The method of claim 1, wherein:

the barrier film is formed on a wall of a concaved portion provided in an insulating film;

the step of growing the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.

13. A method for producing a semiconductor device, comprising the steps of:

depositing a first conductive film on a barrier film having a crystal structure;

forming a second conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film,

wherein the thickness of the first conductive film is set to be equal to or smaller than a 1/4 of the total thickness of the first conductive film and the second conductive film.

14. The method of claim 13, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than 2.2 $\mu\Omega \cdot$ cm.

15. The method of claim 13, wherein the step of depositing the first conductive film is performed at a temperature which is equal to or lower than a 1/3 of the absolute

temperature of the melting point of the first conductive film.

16. The method of claim 13, wherein:

the barrier film is formed on a wall of a concaved portion provided in an insulating film;

the step of depositing the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.

17. A method for producing a semiconductor device, comprising the steps of:

depositing a first conductive film on a barrier film having a crystal structure;

forming a second conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film,

wherein the thickness of the first conductive film is set to be equal to or smaller than 120 nm.

18. The method of claim 17, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than 2.2 $\mu\Omega \cdot cm$.

19. The method of claim 17, wherein the step of depositing the first conductive film is performed at a temperature which is equal to or lower than a 1/3 of the absolute temperature of the melting point of the first conductive film.

20. The method of claim 17, wherein:

the barrier film is formed on a wall of a concaved portion provided in an insulating film;

the step of depositing the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.